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ABSTRACT

Guidelines are presented for modifying basic instruction of subtraction facts for elementary level learning disabled students. A detailed case study is used to illustrate a five-step structured program: (1) find a way to work it out; (2) add to check; (3) learn the partner facts; (4) study families of facts; (5) review and practice. The selection of appropriate sequences, techniques, and activities that incorporate students' learning strengths is emphasized. Appendix A lists specific strategies for modifying activities to meet individual learning needs (auditory, visual, kinesthetic/tactile) and address receptive, expressive, and abstract reasoning difficulties. Appendix B offers memorization strategies tailored to auditory, visual, and kinesthetic/tactile learners. Activities using mechanical aids (calculator, language master, tape recorder) are described in Appendix C, while Appendix D suggests activities to help children speed up their responses once they have mastered strategies. Management strategies for teacher and child, described in Appendix E, focus on organization and use of facts, application of basic facts to computation, self-management (staying on task), and record keeping. (JW)

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VAKT FOR BASIC SUBTRACTION FACTS

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VAKT FOR BASIC SUBTRACTION FACTS[†]

Each learning disabled student has a unique learning style which differs markedly from that of non-disabled peers. These learning styles reflect strengths as well as weaknesses. Because of the diversity of styles exhibited by the learning disabled, we have developed guidelines for helping teachers during basic fact instruction with these students. This paper applies those guidelines to subtraction. And, to highlight how these guidelines can be implemented, a specific case student is also presented.

Guidelines for Modifying Basic Fact Instruction

Guidelines incorporating visual, auditory, kinesthetic and tactile approaches for modifying basic fact instruction to match the unique learning styles of LD students are outlined in Appendix A. We believe that a match between instruction and learning style, like that highlighted in the guidelines, is necessary if LD students are to acquire mastery of the facts.

Fact mastery is one essential component for success in estimation and both mental and written computation. Many children, particularly those with learning disabilities (Fleischner, 1980), fail to achieve a level of fact mastery which would enable them to keep pace successfully with the demands of school programs.

Subtraction appears to cause the most difficulty in fact learning. How do we help students? Research indicates that explicitly teaching strategies for deriving answers to unknown facts, rather than relying only on rote drill procedures, facilitates fact mastery (Carpenter, 1985; Rathemell, 1978; Steinberg, 1984; Suydam, 1985; Thornton, Jones & Toohey, 1983; Toohey, Jones & Thornton, 1985).

[†]NOTE: Ideas shared in this paper have grown out of research, development, and teaching training projects sponsored by the Queensland, Australia, Division of Special Education, P.O. Box 33, North Quay, Queensland 4000; the National Science Foundation's U.S.-Australia Cooperative Research Program (Grant No. INT-8311443); the U.S. Department of Education, Office of Special Education and Rehabilitative Services (Grant No. G008301694, Project No. 0129KH30133); and Illinois State University, Normal, IL 61761.

For LD students the difficulty of mastering subtraction facts is compounded by factors inherent to their unique learning styles. Our experience has shown that it is possible for these students to learn and use strategies for working out unknown subtraction fact answers (Thornton & Toohey, 1984a, b, c; Thornton, Toohey & Jones, 1985). Presenting these strategies in a manner compatible to each LD student's learning style enables this to happen.

The guidelines of Appendix A provide suggestions for modifying core and follow-up activities in terms of both exhibited strengths and weaknesses. Procedures for taking advantage of learning strengths in each of three modalities—visual, auditory, and kinethetic/tactile—are outlined. Ideas for minimizing the effects of weaknesses in receptive language, expressive language and abstract reasoning are also presented.

Frequently learning disabled children exhibit characteristics which suggest a problem related to one particular modality (e.g., auditory). In such cases the initial presentation of the strategy might focus on a modality strength (e.g., visual or kinesthetic). At a relevant stage within the same activity the auditory information would be incorporated or linked to the visual data. Relaying information through different modalities at staggered intervals tends to minimize the effects of stimulus overload to which LD children are prone. In time this approach may assist the LD to attend to relevant features, to organize, to order and to process incoming data in a systematic, logical manner (Smith, 1981).

Some students have difficulties in language and/or abstract reasoning. For these students attention must be directed toward modifying experience to take these specific difficulties into account. Since the child cannot, the teacher must make the necessary adjustments. In so doing the experiences must be directed at an appropriate level. The activity should provide challenge and extend the child but not to the point of frustration.

The degree of challenge inherent in an activity will be determined by its purpose. If the goal for a child with expressive language difficulty is to establish a strategy for working out answers to a particular group of unknown facts, then there might be a lesser demand for full and articulate expression during that activity. Indeed, miming and gesturing, coupled with single words or short phrases, might be acceptable.

On the other hand, if the purpose is to develop sentence patterns related to ideas developed in earlier activities, then a greater demand for verbal expression might be placed on the child. Such a demand, however, would be conditioned by the child's degree of difficulty.

Once mastery of a strategy for working out answers to a group of unknown facts has been achieved, a shift in focus to memorization should occur. Appendix B offers specific suggestions in this regard.

Throughout all phases of development a child needs to be guided into monitoring his own learning. At appropriate times this facet of learning may require explicit attention. In fact, questions used by the teacher to develop a strategy initially might be adopted by the learner in this process. This notion goes beyond developing meta-cognition to include processes which will set the thinking in motion. Helping LD students to learn how to learn and how to monitor that learning is as important as developing strategies for working out unknown fact answers.

The guidelines of Appendix A are not exhaustive. Other aspects such as those related to a child's gross and fine motor skills, might have been included. For children exhibiting difficulties in these areas, decision making in the choice of concrete materials and teaching aids need to be carefully monitored.

Some of these children may need to observe the teacher or peers manipulating materials, and then make predictions or describe outcomes rather than actually carrying out the physical activity themselves. Alternate means of recording data and outcomes may be a further consideration.

Thought also needs to be given to the presentation of material and implementation of tasks with highly active children. Though no rigid rules can be laid down, it is generally agreed that stimulus material should be reduced to the minimum. Any materials (blocks, paper, books, pencils, etc.) extraneous to the task in hand should be removed.

Activities which allow the child to move about legitimately should be built into the program. Manipulative aids (such as the hide-and-seek cards described below) which reflect and enhance an idea being developed should also be utilized. For hyperactive children, the aids should contain the required information clearly and concisely without any adornment.

The needs of the very lethargic child should not be overlooked. Care should be taken to insure that the child is actively (physically and mentally) involved in the task. In this case there is usually a need to make the materials stimulating. Hide-and-seek cards (see below), as well as other aids, could be presented in a much more visually stimulating manner through the use of color, shape, and texture. Such adornments, however, should not overpower the central point being emphasized. The hide-and-seek cards have great versatility and can be designed and used in a number of different ways, as is illustrated in the following report.

A Case Study in Subtraction Fact Learning

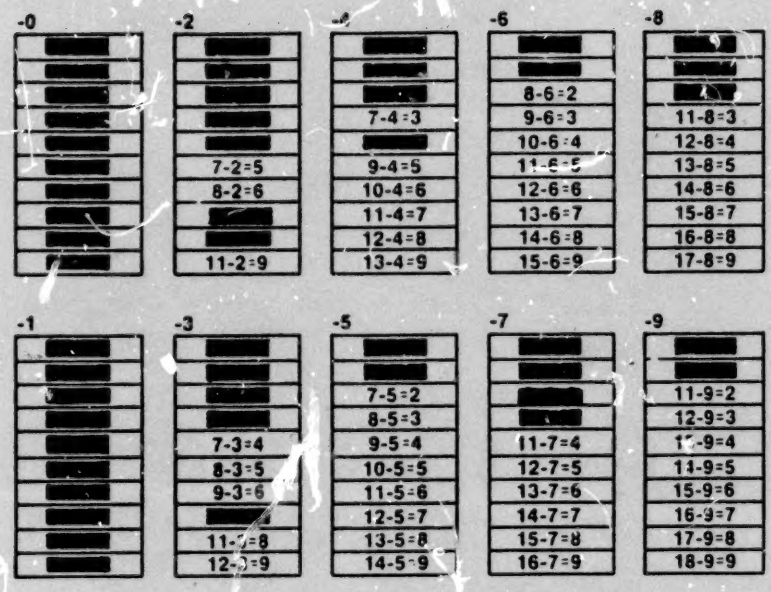
Philip, an LD child of average intelligence, received special education help in math on a withdrawal basis for short periods three or four times a week. A major goal in his program was to help him acquire mastery of the basic facts. The use of hide-and-seek cards to capitalize on his visual strengths in the structured program described below enabled Philip to master subtraction facts in spite of attentional and severe short-term memory deficits.

Prior to this program Philip had demonstrated an understanding of the basic subtraction concept but relied almost totally on "wild" random guesses for getting answers to subtraction facts. As a result he was neither able to correctly carry out written or mental computations nor successfully complete work problems which he otherwise knew how to solve. Inappropriate behaviour and associated frustration was attributed to this lack of success.

Occasionally Philip used the slow and inefficient "three step" approach to complete subtraction facts. That is, he used counters (1) to show the whole; (2) to take a part away; and (3) to count the remainder. Because of his short-term memory deficit, Philip often lost his place or forgot the original task when he applied this approach to longer computations.

In the structured basic fact program planned for Philip, subtraction was delayed until the child had achieved mastery of the 70 "easy" addition facts: Count Ons (+1, +2, and +3 facts); zeroes (e.g., 6 + 0 and 0 + 6); doubles (e.g., 4 + 4 and 7 + 7); and 10 sums (with special focus on 4 + 6 and 6 + 4). In the interim Philip used a list on which known facts were "blacked out" for completing computations. The subtraction list is shown on the following page.

Philip was able to refer to these lists for unknown facts. His behaviour improved as his successes increased. As mastery of other facts was achieved, they, too, were crossed out. Philip had a visual record of his improvements and this in itself proved to be a highly motivating factor for him.



PHILIP'S "BLACK OUT LIST" FOR SUBTRACTION.
A SIMILAR LIST WAS CREATED FOR ADDITION.

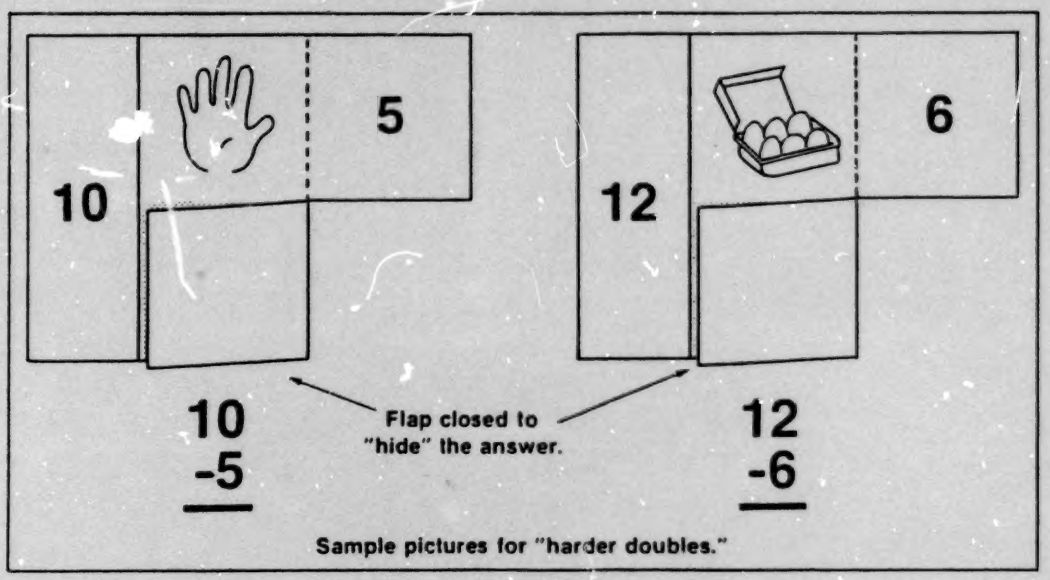
The program which led Philip to successful mastery of subtraction facts was based on five basic steps. These steps are outlined and then discussed below. The small step size of instruction which was part of Philip's program characterizes an approach which we believe is critically important for fact learning and retention by LD children.

SUBTRACTION FACT MASTERY: 5 BASIC STEPS

1. FIND A WAY TO WORK IT OUT.
2. ADD TO CHECK.
3. LEARN THE PARTNER FACTS.
4. STUDY FAMILIES OF FACTS.
5. CONTINUE REVIEW AND PRACTICE OF FACTS.

These five basic steps were applied to each cluster of facts which were organized on the basis of a common strategy for recall. The following paragraphs describe how, at each step, the hide-and-seek cards were integrated with activities and other techniques to assist Philip in mastering each new set of unknown facts.

Finding a way to work it out. Subtraction doubles represented by pictures were studied first to take advantage of Philip's visual strengths. The easier doubles involving small numbers (4-2, 6-3, and 8-4) were only reviewed as Philip already knew them. Unknown doubles were learned by using the pictures from addition which were familiar to him.



Sample pictures for "harder doubles."

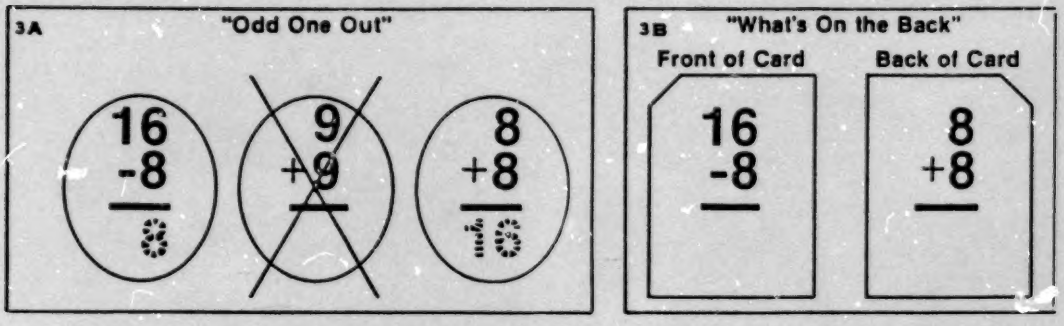
The focus initially was to use the picture as a visual prompt to work out the answer to an unknown double. Philip then would open the flap to check his answer.

Adding to Check. Philip was guided to "see" that addition could be used to check subtraction answers. The pictures on the hide-and-seek cards were used to reinforce the relationship between addition and subtraction.

Examples. 16 - 8 = 8 *because* 8 + 8 = 16. (In the U.S.A., we refer to this as the crayon fact since we use a box of 16 crayons as the visual model. In Australia, this is the octopus fact.)

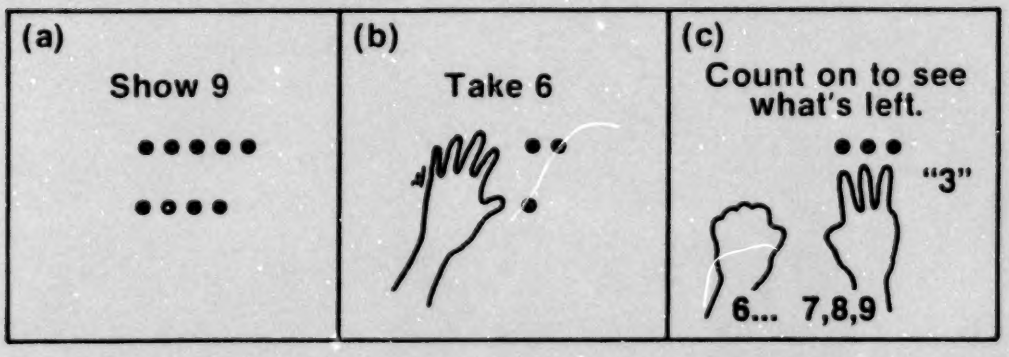
10 - 5 = 5 *because* 5 + 5 = 10. (We call this the fingers fact.

Additional practice was provided by many other discrimination ("e.g., Odd One Out") and matching (e.g., "What on the Back") activities.

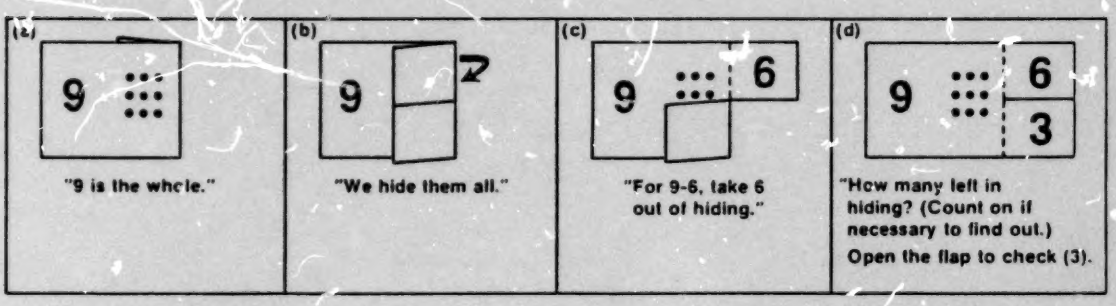


In the first exercise children cross out the "odd" one and only complete the related subtraction-addition pair. Figure 3b illustrates cards used in a game played by two children. Each player in turn identifies the related addition fact printed on the back of a card.

Other Facts: Finding a way to work it out, then adding to check. Counting on was the method selected as a first step for other facts. Initially, to insure that the count was short, only those facts that had an answer of 1, 2, or 3 were selected (e.g., 12 - 9, 8 - 6, 9 - 8). To develop the "counting on" strategy, counters were used as shown.



Once the counting on skill was established, it was used with the hide-and-seek cards.



Once Philip was able to handle this counting on process, he was guided to check his answers by adding. Manipulating the hide-and-seek cards in this second stage of the program proved most effective in helping Philip visualize ("see") the relationship between subtraction and addition facts. Matching activities were included at this stage as a follow up.

Find the Pairs

11-9= ___	6+6= ___
14-7= ___	9+3= ___
12-6= ___	8+4= ___
12-9= ___	9+2= ___
	7+7= ___

Steps

Read the fact:	"11-9"
Trace the 9:	11-9
Find the fact to make the pair 9 + 2.	
Trace the 9; underline the other number (2)	9+2
Finish the facts. Draw a line to show the pairs.	

Philip was expected to make "pairs" by matching subtraction and addition facts. If necessary, Philip used the hide-and-seek cards to complete the matching process. If the cards were not needed for the actual matching, they were used to check the pairs. Philip also used these cards to make lists of subtraction and addition facts, and to check completed worksheets. Over time, the emphasis given to this "add to check" phase led Philip to use addition rather than counting to answer unknown subtraction facts.

"Partners," the term applied to related subtraction facts like 9 - 7 and 9 - 2, were introduced only after Philip had mastered subtraction count ons (facts having 1, 2 or 3 as an answer). For some students, "partner" activities might be used to develop the relationship between known subtraction facts. For Philip the basic goal at this point was to help him use facts he knew well to learn related but unknown facts like those in the second column below.

Count On Fact ⟶	Partner Fact
9 - 6 = 3	9 - 3 = 6
10 - 8 = 2	10 - 2 = 8
8 - 7 = 1	8 - 1 = 7
12 - 9 = 3	12 - 3 = 9
10 - 7 = 3	10 - 3 = 7

The basic relationships of part, part whole was incorporated into an activity using counters to introduce the partner idea. Again the hide-and-seek cards proved most useful in reinforcing the partner relationship. Other follow-up activities included:

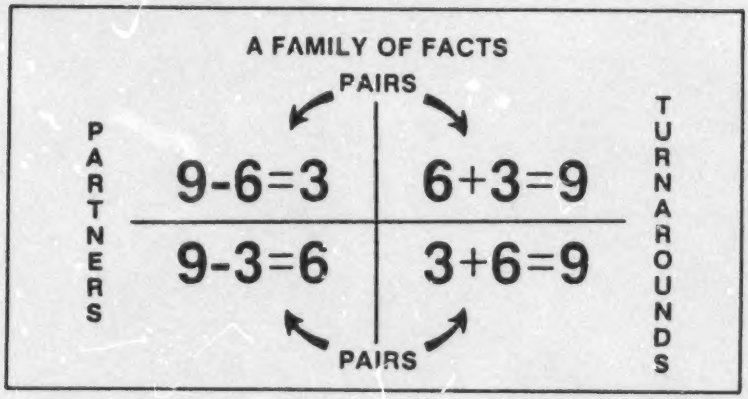
YOU SHOW: As facts were completed (orally or written) their partners were recorded.

YOU COLOR: Partner facts were colored the same, either before or after worksheets were completed.

YOU DRAW: Philip drew a card from the pack, then matched and read the partner fact. Reading the facts provided opportunities for overlearning, and was necessary because of the student's short-term memory difficulties.

Concentration (Finding Partners): This particular game was chosen as a memory building strategy and proved to be very popular with Philip.

Studying Families. Philip's program in the regular class followed the traditional approach which emphasized families very early in number fact development. The many relationships involved in the "family" idea leads to memory overload in cases like Philip's.

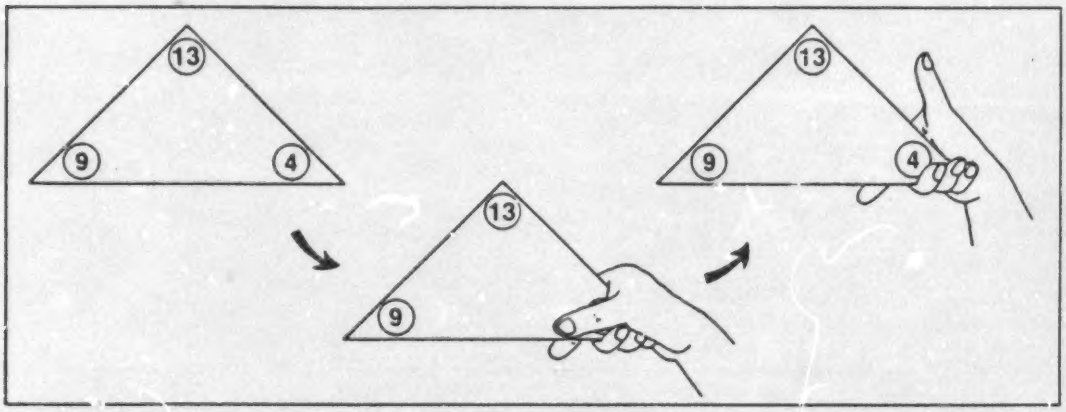


Philip's remedial program endeavored to reduce memory overload. The family concept was delayed until the simpler relationships—turnarounds (commutatives), pairs and partners—had been consolidated one by one.

Fact families were thus used to consolidate known facts and to integrate their relationships. By this stage the hide-and-seek cards could be used to their full capacity. All four facts and their various relationships could be demonstrated on them. Philip continued to use the cards in follow up activities to check his answers and to write fact families on request.

Other follow up activities included "Triangle Families" and "Family Search." In the former, Philip would choose a triangle card, cover one number with a finger, and either write or read a fact using the other two numbers on the card (e.g., 13 - 9 = 4).

All facts which belonged to the family were derived in a similar fashion. Answers to each fact could be checked by revealing the hidden number on the triangle card.



"Family Search" required Philip to draw a card, read it, and complete the fact. Finally he found and read other cards in the same family as the first which were spread around the room.

"Family Search" allows hyperactive children to move legitimately. This activity can be presented in a variety of ways. One which is very popular is to place the facts on children's backs. Children move around the room, read the facts on each others' backs, and get together to form a family. The hide-and-seek cards are used as needed to check answers.

Continuing Review and Practice. Practice activities were carried out in each of the preceding steps, but only after the central idea was established. Philip continues to require regular drill activities to maintain his knowledge of facts and to develop his speed of response. For the remainder of the program Philip will require short daily drill session on known facts (all operations). He will need to continue with this practice even beyond the year's program outlined for him if the acquired knowledge is to be sustained and consolidated in long term memory.

Specific activities which have interested Philip and have helped to maintain motivation include "Ghosting," "Pleat the Paper," and "Beat Yourself." These activities are described in Appendix B along with other memorization strategies.

Summary

For students like Philip, a structured program based on the five steps detailed above for each cluster of facts is imperative for mastery of basic facts. Equally important is the selection of appropriate sequences, techniques, and activities tailored to match the learning style of the students involved. "Learning style" incorporates strengths as well as weaknesses. Too frequently in special education the focus is

on weaknesses, and strengths are overlooked. From this and many other cases, delaying subtraction until the relevant addition facts have been mastered would appear to be a critical factor. This may be true for regular as well as handicapped students.

Presenting subtraction and addition facts concurrently appears to lead to confusion for many children. Deferring subtraction in Philip's case certainly proved successful and the use of the hide-and-seek cards contributed significantly. The cards themselves are a valuable tool, but the method of presenting them was of even greater significance. This was done in such a way as to capitalize on Philip's visual strength.

For another child with different strengths (e.g., auditory or kinesthetic), the same card could be used but its presentation would vary. Students with kinesthetic strengths might be encouraged to trace textured pictures on the cards. (See Appendix A.) Oral directions would precede the physical manipulation for students with auditory strengths.

Example. *Four*teen . . . *for*tnight.

14 - 7 = 7 because

7 + 7 is the *for*tnight fact.

7 + 7 is *four*teen.

(*Note:* Philip is an Australian lad. In Brisbane, "fortnight" is used colloquially, and Philip was familiar with the term.)

Thus while the content remains constant, the sequence and presentation of that content will need to be taken into account when planning remedial programs for LD students. Likewise, teaching and learning aids such as hide-and-seek cards can be designed which can be used for these students who exhibit a range of learning styles. One need only to modify the aid to match the particular, idiosyncratic style of learner. Successful basic fact programs can be structured and presented in ways which take advantage of an LD student's strengths in order to minimize the effects of that pupil's learning weaknesses.

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BASIC FACTS: MODIFYING ACTIVITIES TO MEET LEARNING NEEDS OF INDIVIDUAL CHILDREN†

(Learning strengths and weaknesses are considered.)

A. FOR AUDITORY LEARNERS

1. Introducing an Activity

a. Precede the activity with a verbal overviewing of what is to happen. When possible, link it to previous experiences and related activities.
b. Ask the child to tell what he remembers from the preceding lesson. Correct/extend as necessary, and build from there with a verbal overview of today's lesson.

2. General Procedure

a. Precede all actions and demonstrations with spoken instructions. Each step may comprise two parts:
   1. Oral instructions only
   2. Oral instructions closely followed by visual stimulus, concrete manipulation or demonstration.
b. Provide a verbal summary of each step.
c. Use key words to focus the child's attention, if necessary.
d. Remove extraneous visual stimuli.

3. Modifications in the Use of Sentence Patterns

Emphasize the oral aspects, based on the child's understanding.

a. Have the child close his eyes as he listens. This may help cut out distracting visual information and help him to concentrate on processing the words.
b. Encourage the child to read aloud and direct him to listen to himself.
c. Stand behind the child and say or read the sentence with him.
d. Prepare a set of language master cards which contain the key sentence for review and individual practice. Write the sentence. Put the picture on the back.
e. Employ oral cloze procedures (tape or language master).

4. Modifications in the Use of Worksheets

a. Have the child listen as the teacher, aide or peer reads the title, instructions and examples aloud.
b. Encourage the child to read aloud the instructions.

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†This outline was written by Margaret Toohey and forms the framework for the VARIATIONS sections of MATHFACT—An Alternative Program for Children With Special Needs, a series of four basic fact kits co-authored by Carol A. Thornton and Miss Toohey, developed with the support of the Division of Special Education, Queensland, Australia.

c. Tape the instructions and/or the examples, if necessary, and have the child complete written work as he listens to the tape.
d. Read the instructions, then ask the child to tell in his own words, what is to be done.

B. FOR VISUAL LEARNERS

1. Introducing an Activity

a. Pictures and/or actions could be used to link the current activity to previous learning experiences and to focus the child's attention on main aspect.
b. Call on child to write sentences or draw pictures on the chalkboard that summarize important points of the previous lesson. Correct/extend as necessary, and build from child's input to provide a visual overview of today's lesson.

2. General Procedures

a. Precede all oral instructions by the concrete manipulations, mime demonstration. Each step may comprise two parts:
   1. Presentation of visual stimulus only.
   2. Visual presentation in conjunction with verbalization.
b. Have children describe mimed or demonstrated action, pictures, concrete manipulation, etc.
c. Provide a visual summary of each step.
d. Encourage the child to make mental images of visual stimulus. Provide opportunity for him to reproduce these images (verbal, pictorial).
e. Use cue cards to focus the child's attention.
f. Try a silent lesson.

3. Modifications in the Use of Sentence Patterns

a. Focus on visual pattern. Use:
   1. Words
   2. Pictures
   3. Words and pictures.
b. Highlight key elements by the use of:
   1. Size
   2. Colour
   3. Marking
c. Record for a selected period of time on:
   1. Blackboard
   2. Bookmark for personal use
   3. Special book, or inside cover of maths pad.
d. Build up chart of sentence patterns.
e. Cut and reassemble for review and practice.
f. To practice discrimination, cut and reassemble more than one sentence.

4. Modifications in the Use of Worksheets

a. Highlight key words, features (child or teacher) before starting the worksheets.

b. Draw pictures, diagrams.
c. Visualize a picture. Close eyes.

C. FOR KINESTHETIC/TACTILE LEARNERS

1. Introducing an Activity

a. Actions could be used to link the current activity to previous learning experiences and to focus the child's attention on the main aspect of this activity. The child should carry out the actions or the teacher should guide the actions made by the child.

2. General Procedures

a. Precede all instructions by the physical manipulations of objects by the child. Teacher should guide all manipulations. Each step may comprise two parts:
   1. Physical manipulation only
   2. Physical manipulation in conjunction with oral instructions.
b. Remove visual stimulus, if distracting. Have the child close his eyes, or place objects in his hands behind his back.
c. Provide a summary (physical manipulation of each step).
d. Use a cueing system to focus the child's attention.
e. Make use of textured material (pipe cleaners, sandpaper, plasticine), sandtrays and magnetic boards.

3. Modifications in the Use of Sentence Patterns

Focus on textured patterns.

a. Use the ideas presented in B3, BUT use pipe cleaners, sandpaper or glitter glue to highlight key words.
b. Have the child finger trace over the words (in pad or on blackboard) or write them in sand (use a baking tray and sugar dispenser).
c. Black out visual stimulus (eyemask), if necessary. Teacher guides the child's hand.
d. For individual facts, make sandpaper cutouts for child to trace.

4. Modifications in the Use of Worksheets

a. Have the child trace over the picture, words and symbols. Modify the worksheet to allow for this, rewriting in larger print, if necessary.
b. Modify and use array (hide and seek, subtraction, multiplication, division, doubling) or other appropriate picture cards for use with worksheets:
   1. with clear glue
   2. cut out holes for dots. Use strips, if necessary.
c. Have the child draw and trace picture to represent the given example.

D. RECEPTIVE LANGUAGE DIFFICULTIES

1. Present the activity as given but break instruction into smaller units.
2. a. Exaggerate key words, phrases.
   b. Pause before or after key words are used.
3. Use pictures, gestures, concrete manipulations and written material to supplement the words. Match to child's needs and preferences. Draw on Sections B and C for ideas.
4. In severe cases some use may be made of the deaf sign and cueing system. Care must be taken if this approach is to be adopted.
5. Present sentence patterns in written form. Break into meaningful units (phrases).
6. Modify worksheets according to D-5 and ideas from B and C-4.

E. EXPRESSIVE LANGUAGE DIFFICULTIES

1. Follow activity as outlined. When oral responses are required, accept child's modified versions as interim measures. The child may use:
   a. key words
   b. key phrases
2. Allow sufficient time for the child to express ideas (e.g., 10-second wait periods). Accept breaks in responses. Monitor carefully, do not rush the child.
3. Avoid speaking for the child.
4. Accept child's use of aids, to supplement his attempts to exhibit meaning:
   a. concrete manipulations
   b. gestures
   c. mime
   d. drawings.
5. Accept key words combined with actions for sentence patterns.
6. Modify worksheets. Require less (but be selective!). Place answer digits randomly along page margins or tape these to a place clearly visible from child's working area. Alternately, post a number chart or hundreds chart on the wall to which the child can refer.

NOTE: Some children do not necessarily need to use materials. They sometimes devise their own styles (abridged mime) to indicate understanding.

F. ABSTRACT REASONING DIFFICULTIES

1. Present activity as given. Stress the actions and use of array, clock, doubling, multi-division, hide and seek (subtraction), or other appropriate picture cards and aids.
2. Try to ensure that the link between the words and actions has been made. Have the child describe the action as it is carried out.
3. Have the child carry out any manipulations of concrete materials.

4. Use pictures to supplement written symbols. Stress, and where necessary, modify the use of cards and aids listed in F-1.
5. Kinesthetic/tactile strategies are sometimes appropriate. Draw on ideas from Section C.
6. For sentence patterns, use a pictorial form OR a written sentence by the picture. See Sections B and C.
7. Modify worksheets. Incorporate pictures, cards and aids listed in F-1.
8. Encourage the child personally to use the F-1 picture card, and aids.

MEMORIZATION STRATEGIES

PURPOSE: To help learning disabled children select, modify or devise strategies which will help them remember the strategies and to acquire automatic recall of facts.

Introductory Comment:
If possible, have the children try to verbalize how they remember facts.
Build on to these strategies or help the child to modify them if necessary.
Where the child is unable to verbalize his strategies or doesn't appear to have developed memorization strategies, present him with a range of strategies over a period of time. Help him to select those best suited to his needs and modify where necessary.
Remember to consider both his learning strengths and weaknesses when selecting and/or modifying strategies.

IDEAS: Auditory Emphasis:

(a) Stress the sentence patterns developed in each teacher-directed activity. Modify to meet an individual's needs.

(b) Close. In reviewing a strategy, orally prompt the child's response for unknown fact. Example: 14 - 7: "Fourteen take seven is an easy double. That's the fortnight fact. Fourteen take seven equals ... seven."

Now follow with: "Fourteen take seven is an easy double ... that's the ... (fortnight fact). Fourteen takes seven equals ... (seven)."

(c) Say with me: Sit by the child as he completes a worksheet of facts. This worksheet should contain many known facts but repeatedly present the one or two troublesome facts on which you are working. The child works through the sheet. When the difficult fact is encountered the child says the fact aloud with the teacher. The teacher should take care to speak clearly into the child's dominant ear.

(d) Oral Patterning: To be used only after the strategies have been developed, particularly for those facts causing difficulty. Have the child identify the strategy for a particular set of numbers and then recite the family of facts. Example:

Difficult fact 17 - 8 = 9	17, 8, 9

Near Ten or Near Double fact (whichever one the child prefers)
The family of facts for 17, 8, 9 is:
Eight and nine make seventeen,
Nine and eight make seventeen.
SO seventeen take nine leaves eight
and seventeen take eight leaves nine.

(e) Use of Rhymes: For children who have strengths in the area of language, rhymes can be used after the strategies are understood to help them recall the appropriate strategy. The following by Moira Cochrane are included. The teacher and child together may develop others to suit individual needs.

ADDITIONS AND SUBTRACTIONS

I can do additions,
And not get in a stew,
Count-ons—Doubles—Turnarounds
Are not so bad to do.

I use the rules to help me,
I try to concentrate,
But if additions disappeared,
Wow! How I'd celebrate.

Now I've done addition,
And learnt to plus a plus,
I can tackle subtraction,
Without a lot of fuss.

Part and part make the whole,
Whole take part, leaves part,
If I can just remember that,
I'll make a flying start.

FAMILIES

I've a family of mice
In a wire cage downstairs,
Eight twitchy, whiskered mice
With shiny, silky hairs.

I've a family of facts
Inside my homework book
Not so different from my mice
When I stop and take a look.

For this family of facts
With parts of five and three,
Add up to eight—same number as
My cute mice family.

Partners are the parts I take,
Turnarounds are the parts I add,
And pairs are one of each of these
But eight is Mum and Dad.

For whether I take parts away
Or turn the parts around
Within this family facts for eight,
The answer must be found.

When I play with my mice
And let three crawl on me,
I know that five are in the cage,
Protesting noisily.

So a family of facts
Isn't hard to understand
But families of mice are best
Nibbling at your hand.

ZERO SUBTRACTIONS

Take zero from the whole,
And the whole won't turn a hair,
The whole will just remain complete
And keep on being there.

Take the whole from whole
And then the page looks bare,
With just the zero left behind
For the whole's no longer there.

PAIRS

If eight and one make nine,
And I know that they do,
Take one away from nine,
That answer's easy too.

Nine take one leaves eight,
One plus eight makes nine,
When I think about these pairs,
I get them right each time.

PARTNERS

Fourteen flamingoes
Sitting on a pole
Fourteen flamingoes
Make up the whole.

Take away five
And leave nine there
I've taken a part
But flamingoes don't care.

I put five back
To make up the whole
And fourteen flamingoes
Wave from the pole.

Take away nine
And five stay behind
I've taken a different part
Still flamingoes don't mind.

Nine and five are parts
And fourteen is the whole
"All delicious" said the crocodile
Hiding near the pole.

COUNTING TO SUBTRACT

When the number you take is more than three,
Count on.
When the number you take is three or less,
Count back.
Look at the problem you have to do,
Remember the hint I've just told you.
You'll find it works once you've done a few
And maybe you'll grown to enjoy them too!!

SIGNS

I'm a plus,
A useful plus,
Two straight lines will create me,
One goes down, one across, you see,
I stand on one leg,
Quite steadily
I'm a no fuss PLUS.

I'm a plus,
A useful plus,
I add the parts to make the whole,
Addition is my life-long goal,
When you want to add eight and three,
Right in the middle goes good old me.
Two lines that cross,
Will make my sign,
I add your numbers all the time.

I'm a take away,
A useful take away,
I'm a sign that you all know,
A short, straight line, west to east I go,
Just like a dash
That's how I look
Inside your mathematics book.

I'm a take away,
A useful take away,
I'm used to take a part away,
I do enjoy the role I play
To go between an eight and three,
And know you'll take away with me.
A little line,
Will make my sign;
I take away parts all the time.

DOES ANYBODY KNOW?

Does anybody know
Why ducks can't plus a plus
And snakes can't cope with maths at all
Without a dreadful fuss?

Does anyone know
Why worms won't multiply
And platypusses can't divide,
No matter how they try?

Does anybody know
Why turtles can't subtract
It's not because they don't know
I know that for a fact.

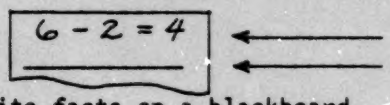
And who can tell me why
Frogs can't add two and two
It's ... because they don't have digits ten
To help keep count, like you!!

(f) Use of Tape or Language Master. From the worksheets the child selects examples which he found difficult and for which he needed concrete aids. He then records them on a tape or language master. Space is left after each completed fact. The child listens to the tape and says the facts with the tape. At a later stage the answer can be deleted and the child records the completed fact in the space provided.

VISUAL EMPHASIS:

Stress the visual presentation of facts, pictures, and patterns (dots).

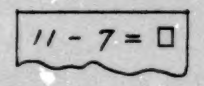
(a) Write over: (Plastic overlay for Worksheet or cards is required.) The children place worksheet or card under the plastic. They then trace over each number fact and rewrite it as suggested below.



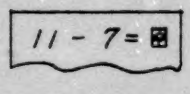
Children may write facts on a blackboard.

(b) Pleat the paper: (Loose sheets of paper are required.)

1. The teacher writes the unknown fact without an answer at the top of the page.

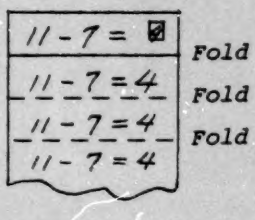


2. The child reads the fact and tells the strategy to be used to get the answer. (Teacher can prompt the child.)



3. The child writes the answer. Then the child traces over the fact and the answer, saying each aloud as he traces. The child repeats until he knows the fact.

4. The child folds the paper down to hide the fact and rewrites as shown.

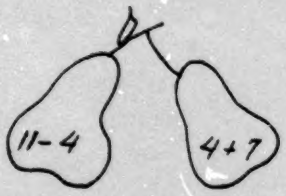


5. The child opens to check his answer.
   - if incorrect, return to step 1 or another activity to reteach an efficient method for memorizing the fact.
   - if correct, repeat the folding, writing, and checking until 3 consecutive answers are given.

(c) Make Picture Associations: The teacher and/or the child can develop a series of pictures to reinforce the oral patterns.

Example:

Pair:



A pair of pairs.

Activities could be developed to consolidate these associations.

PAIRS: Use a tree branch or a picture of a bare tree. Children find pairs of pairs link and attached to tree.

Join with pipe cleaners.

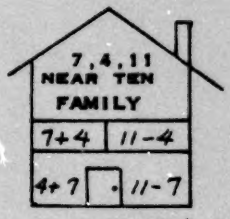
Join back to back (nylon, velox) and use wire, tape or pipe cleaners to attach to branch. Several branches may be built up as new facts are learned (count-on tree, zero tree, etc.)

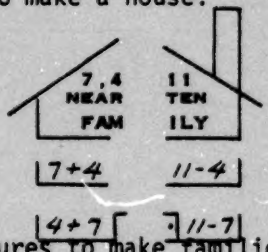
PARTNERS:

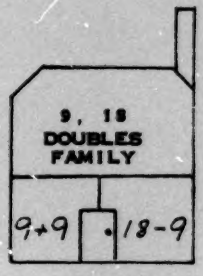
Partners:

A picture outline displaying different tasks could be presented. Children match partners (e.g., cowboys cutouts with facts written on their chests) to carry out specific tasks (muster the cows, cook dinner, clean saddles, brand the cattle, etc.)

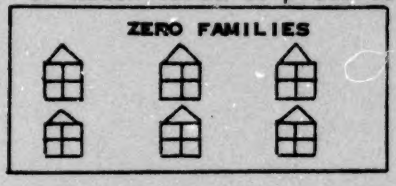
FAMILIES: Children match facts to make a house.

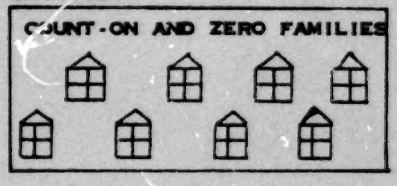






or match cards to pictures to make families.





Reverse Side

The game "Happy Families" could also be played.

(d) Picture the Fact: (Mental Image)
The purpose of this activity is to train the child to make mental images of the visual pictures. The following is one procedure that can be used.

Stage 1.
- Study the picture (dot pattern, whole, parts; doubles, near-doubles pictures; hide-and-seek cards.)
- Let your eyes be a camera, and take a photograph.
- Close your eyes. The picture is on your eyelids.
- What can you see?
- What story (numbers facts) does the picture tell you?
- Say them.
- Write them.

When children are able to do this, move to Stage 2.

Stage 2. • Read the fact (11 - 8)

• Close your eyes.

• Describe or draw the pictures you can see for this fact.

• Complete the fact (11 - 8 = 3)

Kinaesthetic/Tactile Emphasis:

(a) The child selects one fact from those not known. The teacher writes the fact in large numbers on a card saying the fact and its answer as it is written. The child then traces over the fact saying each part as it is traced. The child repeats the tracing until he feels he can say or write it without looking at the card. He closes his eyes, writes the fact in mid-air saying it as he goes. (During this time the teacher writes the fact without the answer on the reverse side of the card.)

Select the next step according to the child's learning needs.

(i) When the child opens his eyes let him immediately check his answer by referring to the answer side of the card. Then, reversing the card, have the child copy and complete the fact on his pad. He could then check by turning over the card.

(ii) When the child opens his eyes, direct him to write the fact and answer on his pad. He can check by referring to the answer side of the card.

(iii) When the child opens his eyes, he should copy and complete the unfinished fact. He can check by referring to the answer side of the card.

Repeat the procedure for other facts being careful to work on 2 or 3 unknown facts in a session. Cards could then be stored in an envelope for re-use in The Bank, Beat the Teacher, Five Up, and other similar activities. They could also be used for review at the beginning of each session. If, during this review, the child hesitates in answering, repeat Trace.

(b) Ghosting. Write the unknown fact with answer in large print on the blackboard. Have the child trace over the fact with his finger saying each part aloud. Repeat the tracing until the "ghost" of the fact remains (until the chalk has been rubbed out).

VARIATION: (for children with visual deficits)—Have the child close his eyes while the teacher guides his hand in tracing the fact.

(c) Stencils. (Cut out cardboard stencils of unknown facts—not duplicating masters.) Using the stencil the child "writes" the fact with a finger, saying each part aloud. The child can then use a crayon to fill in each part of the fact. Lifting the stencil, the child can then rewrite the fact besides the colored one.

(d) Sand Tray. (A sand tray, baking dish and sand will be required.) The child copies the number fact in the sand, saying each part aloud.

ALTERNATIVE: Place the card with the unknown fact in the tray and sprinkle lightly with sand. Have the child trace over the fact saying it aloud as he does so.

(e) 3-D Facts. (String, sandpaper or other textured number fact cards will be required.) Have the child finger-trace over the unknown fact, saying it aloud before writing it.

(f) Finger-Trace. (Number fact cards with the fact and answer on one side, fact only on the reverse side will be required.) The child finger-traces and says the fact with the answer. Then reversing the card he reads the fact and gives the answer immediately. The fact could then be written.

ALTERNATIVE: After tracing, the child could close his eyes to PICTURE the fact in his mind as he writes it in mid-air. While writing, the child should say the fact with the answer. After opening his eyes and checking, he could reverse the card as above.

ACTIVITIES USING MECHANICAL AIDS

Mechanical aids such as calculators, language masters and tape recorders cannot replace understanding but can be used to supplement activities and provide another medium of presenting the material. Though they should not be used exclusively, they do provide the opportunity for individual experience.

A. Calculators

Calculators should only be used when children have the necessary prerequisite skill and understanding to carry out the required task. This includes those skills and understanding related to the machine. Several commercial companies have produced machines with programs aimed at the development of specific skills related to numbers. Some of these machines have set programs which cannot be altered. Others have features which allow specific examples to be programmed. Four commercial machines available are *Little Professor, Winky Cool, Data Man* and *Maths Marvel*. These machines come with booklets which detail their functions.

Ordinary calculators may be used in a number of ways.

They can be used to check answers on worksheets. Children can be given the opportunity to find their own errors before the teacher works through the sheet with the child.

They can be used to generate a number of facts for comparison (PAIRS, PARTNERS, TURNAROUNDS).

Machines with larger key faces can be used by children with motor problems.

The machines can be used for games and speed-up activities.

Care must be taken to ensure that children use the calculator appropriately. To point this out to the students, the group can be divided so that some use the calculators and some don't. Times taken to complete specific tasks are then compared.

An individual child could complete two tasks (one without and the other with a calculator) that are similar and then compare the number of correct responses and the time taken.

B. Language Master

A master set of facts can be developed according to the organization within this kit. Each section, count-ons, zero facts, etc. could be color coded to facilitate the use of these cards by children. Color coding helps children find and return facts to their correct place easily.

Children can then use their own record keeping system to select facts for individual practice. If the system is set up the children can go to the language master corner and practice when they have a few minutes to spare, or when they are waiting for the teacher to be free to help them.

Other Uses:

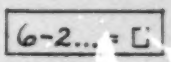
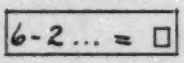
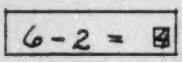
Teacher tapes the fact 6 - 2 without answer on the master track. The child records completed fact 6 - 2 = 4 on second track. He removes the card and checks response written on back. If correct, he goes on to next fact. If incorrect, he records the correct answer and plays it a few times. The child reads the corrected fact with the tape.

$$\begin{array}{r} 6 \\ -\ 2 \\ \hline 4 \end{array}$$

As above, but auditory stimulus only.

6 - 2 = □	Make cards as illustrated.

Record fact on card with answer being recorded after the cut. The child plays teacher's track. When the card stops at the card the child responds. The child then pushes the card on to check his response against the teacher's. If deemed appropriate, the child's response could be written. The child then records the completed fact on the second tract.

Stage 1  Stage 2  Stage 3 

Record the fact (master track) and its answer on the tape. Allow the maximum space available before the answer is recorded. Produce a series of cards (three to five) and reduce the space, each time, before the answer is given. The child tries to give the answer before the teacher's response. The completed fact is then recorded, by the child, on the second track. As the child becomes proficient at one stage, he moves to the next.

C. **Tape Recorder**

A tape recorder can be used in similar ways to a Language Master except—

(a) No visual stimulus is attached to the tape.
(b) One track only is used.

Child can record answers to written work on tape.
Incomplete facts can be recorded on tape at intervals appropriate to the child. The child writes responses or completed facts on paper.
Complete or incomplete facts are recorded. The child identifies the strategy and records it and fact in appropriate column.

Count-on	Zero	Doubles
3. 9-3 = 6	1. 6-0 = 6	2. 8-4 = 4
5. 11-2 = 9	6. 9-9 = 0	4. 14-7 = 7

A set of facts is recorded. The child writes each fact and another that makes the pair, partner.

The child records a set of facts, leaving a space before he gives each answer. He, or another child, then plays the tape and tries to give the answer before the tape.

Incomplete facts are recorded. The child completes only particular facts according to a given criteria, for example, Near Doubles facts.

SPEED UP ACTIVITIES

Once children can complete facts using given strategies, they can be given experiences to speed up their responses. Speed-up activities should only be used with those facts a child knows, but is slow in arriving at the answer. Care should be taken not to prematurely introduce the child to speed-up activities. Some experiences should be included to provide the child with the opportunity of making the decision between a fast response or a slower response in which the strategy is to be used. An activity of this type is included as part of each Checkpoint activity. In introducing speed-up activities, the time allowed should allow the child to respond with a correct response (10 seconds). When a child is capable of responding correctly at that rate, the time allowed is cut back (8 seconds) until such time that he can respond correctly within two/three seconds. Children with motor/language programs should be given special consideration. The time expectation should be carefully monitored. Speed-up activities could take a different form. Example: A child with motor problems could build up speed through the auditory mode by using a tape recorder. Children could keep a record of the times taken over a period of time.

Mix and Match: Use the cards from concentration. Mix them up and place face down on the table. The child turns them over and matches selected facts with answers, Pairs, Partners or Family Cards. The cards are checked for correctness.

Incorrect responses are noted for additional practice. The time taken is recorded--(28 correct in 3 minutes 30 seconds). At a later stage the task is repeated. Facts correct and time taken are compared to previous attempts. (Last time 28/40 correct in 3 minutes 30 seconds. This time 35 correct out of 40 in 2 minutes 40 seconds).

Beat the Teacher

Worksheet Subtraction Kit will be required. Set of 10 number fact cards (no answers).

Present each card, reading the fact aloud. The teacher allows 6 seconds for the child to write his answer in the first column of Worksheet. The teacher gives the answer orally or written. If correct, the child puts an X over his answer and writes the correct answer in the teacher's column. If no answer was recorded, the correct answer is written in the teacher's column. If correct, the child's answer stays. Children enjoy trying to beat the teacher. Modify the times to suit individual's needs.

REPEAT AT A DIFFERENT TIME. GRADUALLY REDUCE THE WAITING TIME TO 3 SECONDS.

Beat Yourself

(A Tachistoscope, flashcards or transparency for an overhead projector will be required.)

(a) Present each fact for a given time (to be reduced gradually to 3 seconds). The child gives an oral response. As above, a record of numbers correct in the given time could be kept).

If children have expressive language difficulties, place cards with answers only randomly about the room. Children can be aided in expressing answers for any of the above activities by referring to the cards. As children become more confident, cards can be removed.

(b) Prepare four small worksheets, each having 10 basic facts (no answers). The relative difficulty of the facts on each sheet should be similar. Give the child one sheet at a time. Allow him 80 seconds to complete the first worksheet, 60 seconds for the second, 50 for the third, and 40 for the fourth.

REPEAT AT A DIFFERENT TIME. GRADUALLY REDUCE THE TIME TO THIRTY SECONDS.

(c) Time Yourself (A stopwatch and worksheet will be required).

Ask the child to estimate the length of time needed to complete a worksheet, e.g., Checkpoint Worksheet could be used. The child completes the sheet and records the time as shown. Using a master copy, the child checks the answers. Incorrect answers are circled for further practice. The teacher can help the child to keep a record of the number correct and the time taken. Children should be encouraged to improve this record.

(d) Five Up.

1. Ask the child to select five known facts from the child's BANK.
2. The teacher flicks thrcugh these flash cards, allowing 3 or 4 seconds for each answer.
3. When the child seems confident of these facts, replace one of the known facts with one that is troublesome to the child.
4. Repeat steps 2 and 3 as often as necessary to incorporate unknown facts. Eventually all BANK cards will be replaced.

THIS ACTIVITY COULD BE USED AT THE BEGINNING AND AT THE END OF A SESSION. REPEAT FOR SEVERAL SESSIONS.

(e) Beat the Calculator

Many of the activities under calculator could be modified to become speed-up activities.
Tape Recorder.
The tape is one means of helping children, with motor problems, build up speed with oral facts.
The activities above (Beat Yourself, Time Yourself) could be modified for use on the tape.
The child could record completed facts on a tape at his own rate. The child can then replay the tape and try to give the answer before the tape. Such tapes could be shared by peers.
The teacher could prepare a tape with completed facts, with a space being left between the fact and its answer.
By building up a series of tapes or within one tape, the times between the fact and answer could be reduced.

MANAGEMENT STRATEGIES

PURPOSE: To help the teacher and the child develop, modify and devise strategies in the classroom to overcome difficulties associated with his learning problem.

IDEAS:

A. ORGANIZATION AND USE OF FACTS.

(a) Number Fact Book—see Getting Started.

(b) Facts Bank. A set of facts written on cards (Teacher could make an ink stencil of all facts and run them off on cards) could be maintained by each child. These cards would be stored in a box labelled "FACTS BANK." The box would be divided into THREE main sections:

Facts I know well.
Facts I can work out.
Facts I do not know yet.

Each of these sections could be sub-divided to organize the facts according to their cluster (count-on, zero, etc.). Such a Bank provides:—

1. A storage place for known facts (to see the number of known facts increase is motivating for children).
2. A set of known facts which the teacher can draw from when preparing individual activities and worksheets.
3. A means for checking long term memory. Children enjoy emptying their banks from time to time to count the number of facts they know. To return the fact to the bank, the child must be able to provide the answers immediately. If the child hesitates on a fact, it is placed either in the teacher's file or with other facts the child is currently studying.

AS CHILDREN WORK THROUGH THE PROGRAM, CHANGES SHOULD BE MADE TO CHARTS AND TO THE "NUMBER FACTS" BANK.

USE OF FACTS

Facts I know well. Knowledge of these facts should be reviewed periodically. The teacher could also draw on these items for other mathematics activities in which the primary focus is not basic number facts.

Facts I can work out. Items from this section should be used when designing activities to provide additional practice.

- Children could select from these cards when playing board games.
- If a language master is available, a set of number facts could be made and organized into sets (count-ons, zeros, etc.). Children could then select cards for additional practice. They could undertake this activity if they finish a set activity and the teacher is not available.
- Facts from this section could be used for further memorization activities. These should be tailored to meet individual learning needs. Oral patterning, rhythmic work, tracing, and writing are some options to be considered (see Appendix B).

Facts I do not know. These items could be used when preparing activities to reinforce existing strategies or to develop others which will lead to the efficient retrieval of the facts. Generally, "think addition" is the most efficient. Counting-on or counting-back are usually temporary strategies and could be used until a child is ready to use addition to help. Only a very small group of children would need to retain counting strategies as the only method.

B. APPLICATION TO COMPUTATION.

In the teacher directed activities and worksheets, sections (LOOK FOR) have been included to prepare children to transfer their knowledge of basic facts to computation. Additional strategies may be necessary.

(a) Review the facts to be used in the computations before they are commenced.

(b) Identify Facts. Read the examples and have the child identify the strategy with the associated basic fact.
Example:

▲ ▲ ●
86
- 53

● Double
▲ ▲ Count-on fact

(c) Learning disabled children commonly exhibit two difficulties related to the use of facts in computation.

(1) Doesn't recall known fact—When presented with new or unfamiliar computation procedures, learning disabled children frequently "go blank" and cannot recall facts already known. The problem is one of transfer to the new situation. Teachers can help by using examples that contain easy facts whenever new work is presented. These facts are more established and are less likely to cause problems. For similar reasons teachers could use examples with easy facts when testing newly learned skills/procedures, in other mathematics areas, e.g., computation and measurement.

Strategies for independent work include:—

- Having the child quietly say the fact as he works. Saying the fact aloud often stimulates recall.
- Having the child finger-trace the fact as it is said.
- Having the child write at the side the fact causing difficulty. Seeing it in isolation often triggers recall.

(2) Doesn't know all the facts—Though all facts are not mastered, some children are ready to handle larger computations. These children could be tested individually. Help the children black out completely all known facts on their worksheets. (A thick felt-tipped pen could be used.) Children should be allowed to refer to this sheet during mathematics lessons to help with unknown facts. Relevant section of the sheet can be glued onto both sides of cardboard to make a book mark for their mathematics pad. As additional facts are mastered, they should be blacked out so children do not become dependent on the sheet for known facts.

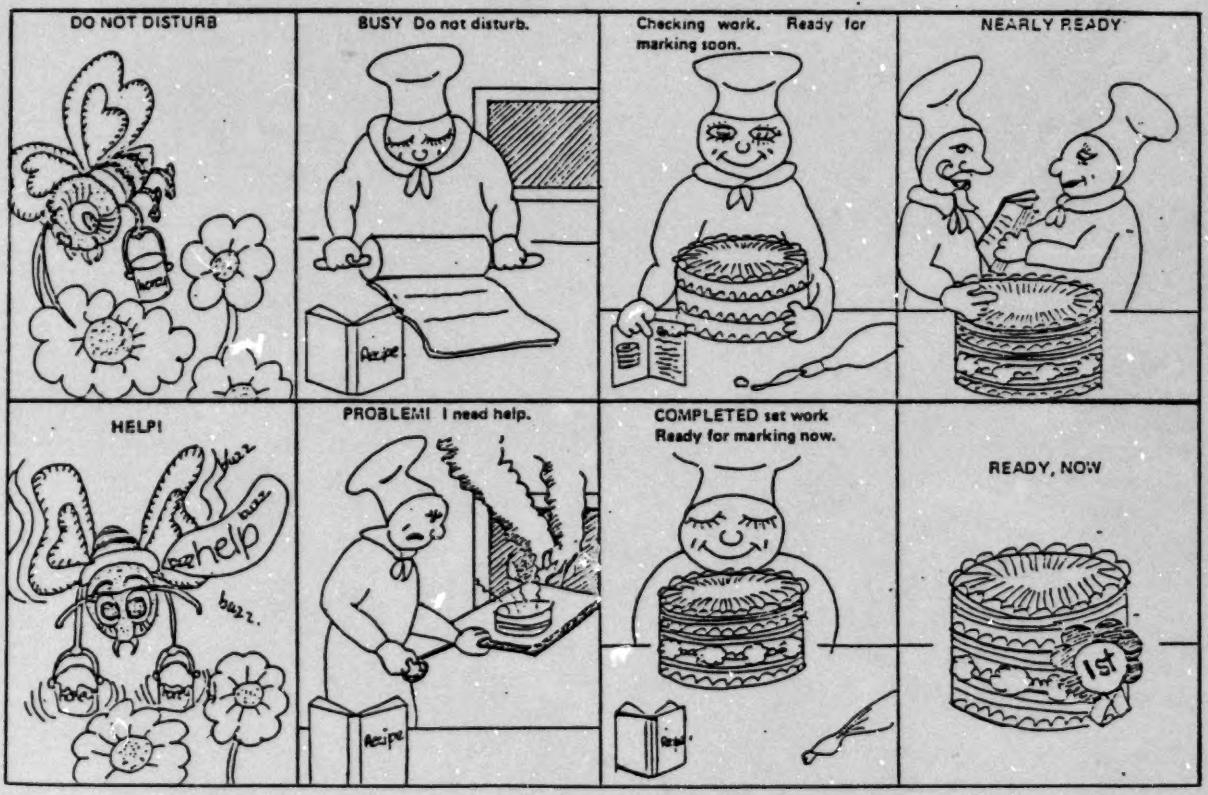
C. SELF MANAGEMENT

PURPOSE: To help the teacher and child to develop strategies which will enable the child to focus and maintain attention on the task.

MATERIALS: CVE Cards

These cards are provided as guides only. The child and teacher should work together to develop cards that will suit the learning needs and behavior management strategies of the particular child.

Message Cards:



The purpose of these cards is to help very active or easily distracted children to stay seated and to remain on task. They should only be introduced when the child's concentration span is of sufficient length (10 minutes) to make their use purposeful.

The child displays relevant sign as he works. When required, he changes the sign and the teacher can go to him rather than have the child moving about the room. However, care must be taken to provide the child, particularly the very active child, with legitimate reasons for moving about the room.

Organizational strategies for individual work cards

Learning disabled students frequently exhibit behavior of disorganization. These cards have been designed to help children work through each given example. Initially, the teacher should work with the child to modify the card and to help the child acquire the skills necessary to use it.

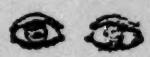
The cards provided focus on major strengths in specific modes and will require modification for children who do not reflect such strengths. For other children the sequence may need to be revealed step-by-step. In this case a cover sheet may be developed.

Example:

LISTEN THINK SORT HOW? DO WRITE CHECK	READ MARK THINK SORT HOW? DO WRITE CHECK	TRACE or MARK THINK SORT MOVE DO WRITE CHECK

Cue Cards

These cards have been designed for use by the teacher as another means of focusing the child's attention. The teacher shows the card, instead of speaking, to indicate the task. Some children who are confused by oral commands, respond well to this visual approach.

WRITE LOOK  LISTEN SHOW

D. RECORD KEEPING

(a) Individual Records
(b) Group/Class Records

(a)(i) Child can build up a "fact bank" (See Getting Started) to keep a personal record of known and unknown facts

(ii) Child can build up a "dictionary" of facts to record known and difficult facts.

Facts could be recorded under strategies, e.g., Count-on Facts, (+2), (+1), (+3), Doubles, Near-Doubles, (+1), (+2), Near Tens, Zero. Known facts could be written in blue biro. Facts that children have had difficulty in remembering could be written in red. Related facts (turnaround, pairs, partners, family) should be recorded as well as relevant memory cue (picture, sentence pattern, diagram, etc.).

Definition of terms, sentence patterns and drawings should be recorded at the beginning of each section.

(iii) Child could glue in blank fact chart in front of maths pad and write in facts as they are learned. Completed fact chart could be glued in cardboard folder and known facts blacked out for use with computation.

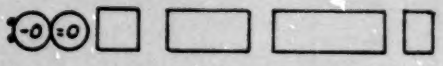
(iv) Teacher could retain copy of fact chart in individual file as a personal record for each child. Instead of writing in facts, dates could be recorded.

(v) Pictorial Graphs, if relevant, could be displayed on notice board to map progress.

(vi) To assist motivation, "a fact worm" etc. could be built on to as facts are learned.

In this case, sections would need to be completed, e.g.—2 and partner facts, rather than individual facts, e.g., 11 - 2, 11 - 9, etc. as in Chart 1. Geometric shapes other than circles could be used, e.g.:

Triangular worm:



(b) Group/Class

(i) Record of Known Facts. The teacher will need to keep records for each student. The following are some suggestions. Information can be recorded in a number of ways.
Record in mark book or on chart.
Allow two lines for each child.
It may be relevant to record additional information about difficult facts and specific learning styles.

(ii) Record of Progress through the Program.
Teacher may prefer to chart progress through the program. Teacher-directed activities and follow-up worksheet and activities are recorded. Pretest and checkpoint may be dated.